IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

ST. JUDE MEDICAL, CARDIOLOGY
DIVISION, INC., ST. JUDE MEDICAL
SYSTEMS AB, and ST. JUDE MEDICAL
S.C., INC.,

              Plaintiffs,

    v.

VOLCANO CORPORATION,

              Defendant.

Civil Action No. 12-441-RGA

MEMORANDUM OPINION

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April 22, 2014

Richard G. Andrews
ANDREWS, U.S. DISTRICT JUDGE:

Pending before this Court is the issue of claim construction of six disputed terms found in U.S. Patent No. 6,565,514 ("the '514 patent")

I. BACKGROUND

St. Jude Medical, Cardiology Division, Inc., St. Jude Medical Systems AB, and St. Jude Medical S.C., Inc. filed a patent infringement action against Volcano Corporation on April 9, 2012. (D.I. 1). On June 25, 2012, Volcano wrote a letter to the Court explaining that "[n]o significant facts are in dispute, and the matter can be resolved in its entirety by the Court's construction of just two claim limitations." (D.I. 16, p. 1). Based on this representation, the Court granted an expedited briefing and argument schedule for the two terms Volcano identified in the '514 patent. (D.I. 23). The Court construed those terms on May 30, 2013, although that construction did not end the litigation. (D.I. 50). A new scheduling order was entered, setting the briefing and argument schedule for the remaining disputed terms in the '514 patent. (D.I. 60). The Court has considered the parties' Joint Claim Construction Brief (D.I. 133), appendix (D.I. 134), and oral argument on April 2, 2014.

II. LEGAL STANDARD

"It is a bedrock principle of patent law that the claims of a patent define the invention to which the patentee is entitled the right to exclude." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (internal quotation marks omitted). "'[T]here is no magic formula or catechism for conducting claim construction.' Instead, the court is free to attach the appropriate weight to appropriate sources 'in light of the statutes and policies that inform patent law.'" *SoftView LLC v. Apple Inc.*, 2013 WL 4758195, at *1 (D. Del. Sept. 4, 2013) (quoting *Phillips*, 415 F.3d at 1324). When construing patent claims, a matter of law, a court considers the literal

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language of the claim, the patent specification, and the prosecution history. *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 977-80 (Fed. Cir. 1995) (en banc), *aff'd*, 517 U.S. 370 (1996). Of these sources, "the specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term." *Phillips*, 415 F.3d at 1315 (internal quotations and citations omitted).

Furthermore, "the words of a claim are generally given their ordinary and customary meaning . . . [which is] the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application." *Phillips*, 415 F.3d at 1312-13 (internal citations and quotation marks omitted). "[T]he ordinary meaning of a claim term is its meaning to [an] ordinary artisan after reading the entire patent." *Id.* at 1321 (internal quotation marks omitted). "In some cases, the ordinary meaning of claim language as understood by a person of skill in the art may be readily apparent even to lay judges, and claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood words." *Id.* at 1314 (internal citations omitted).

A court may consider extrinsic evidence, which "consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises," in order to assist the court in understanding the underlying technology, the meaning of terms to one skilled in the art and how the invention works. *Id.* at 1317-19 (internal quotation marks and citations omitted). However, extrinsic evidence is less reliable and less useful in claim construction than the patent and its prosecution history. *Id.*

Moreover, "[a] claim construction is persuasive, not because it follows a certain rule, but because it defines terms in the context of the whole patent." *Renishaw PLC v. Marposs Societa'*

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per Azioni, 158 F.3d 1243, 1250 (Fed. Cir. 1998). It follows that "a claim interpretation that

would exclude the inventor's device is rarely the correct interpretation." *Osram GmbH v. Int'l*

Trade Comm'n, 505 F.3d 1351, 1358 (Fed. Cir. 2007) (internal quotation marks and citation

omitted).

III. CONSTRUCTION OF DISPUTED TERMS

A. The '514 Patent

The purpose of the invention can be summarized as follows:

> [A]n object of the invention is to provide improved systems for monitoring
> physiological variables, in particular for pressure measurements in the coronary
> vessels, and especially for the reliable determination of Fractional Flow Reserve,
> FFR_{myo}.
> Another object is to provide methods for calculation of average pressure
> values and detection of heart beat[s] using pressure signals from the measurements.
> The present invention monitors, determines by measuring and calculation
> physiological variables related to blood pressure, wherein at least two physiological
> variables, arterial pressure P_a and distal coronary pressure P_d, [are] detected by and
> derived from a guidewire-mounted pressure sensor. Myocordial Fractional Flow
> Reserve (FFR_{myo}) is determined by calculating a ratio P_d/P_a from said measured
> physiological variables (P_a, P_d) and a graph is formed and displayed of the data
> resulting from said calculation.   The invention also provides an Interactive
> [G]raphical User Interface system for controlling the performance of and for
> displaying, in at least one screen on a display in a monitoring unit, intermediate and
> final results of said invented method.
> One advantage[] of the present invention [is] that the FFR_{myo}-value has a
> clear breakpoint of 0.75 between significant and non-significant stenoses. This
> value is easily and rapidly obtained by intracoronary pressure measurements at
> maximum vasodilation by use of the invented method and system.
> Another advantage is that the Interactive [G]raphical User Interface system
> provides a user-friendly handling.

'514 patent, 1:60-2:22. Claim 16, which contains several of the disputed terms, is representative

and recites a:

> System for monitoring, determining by measurement and calculation and
> graphically displaying physiological variables related to blood pressure,
> comprising:
> a graphical user interface for selection of functions from a menu system;

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> a sensor element, said sensor element being capable of detecting continuously at least two physiological variables, arterial pressure (P_a) and distal coronary pressure (P_d) and delivering processable signals to a unit being able to process [] said processable signals;
> a ratio element, said ratio element being capable of calculating a ratio P_d/P_a from said measured physiological variables (P_a, P_d) by processing said processable signals;
> a display element, said display element being capable of forming a graph and displaying said graph of the data resulting from said calculation;
> a marking element, said marking element being capable of marking automatically, or manually by an operator/user, at least one interesting point or portion on the graph; and
> a calculating element, said calculating element being capable of using said interesting point on the graph for calculating a new physiological variable.

Id. at claim 16.

1. "a ratio element, said ratio element being capable of calculating a ratio P_d/P_a from said measured physiological variables (P_a, P_d) by processing said processable signals"

a. *Volcano's proposed construction*: This is a means-plus-function term with the function of "calculating a ratio P_d/P_a from said measured physiological variables (P_a, P_d) by processing said processable signals." The corresponding structure is "a computer program or computer software that can divide said measured physiological variable (P_d) by said measured physiological variable (P_a) by processing said processable signals." If § 112, ¶ 6 does not apply, then the term means "a computer program or computer software that can divide said measured physiological variable (P_d) by said measured physiological variable (P_a) by processing said processable signals."

b. *St. Jude's proposed construction*: "A computer program or computer software that can divide a distal coronary pressure from the measured physiological variable P_d by an arterial pressure from the measured arterial pressure P_a." Alternatively, if § 112, ¶ 6 applies, the corresponding structure would be "a computer program or computer software that can divide a

distal coronary pressure from said measured physiological variable P_d by an arterial pressure from said measured arterial pressure P_a."

                c. *Court's construction*: "A computer program or computer software that can divide said measured physiological variable (P_d) by said measured physiological variable (P_a) by processing said processable signals."

       The term "a ratio element, said ratio element being capable of calculating a ratio P_d/P_a from said measured physiological variables (P_a, P_d) by processing said processable signals" is not properly construed as a means-plus-function limitation.[1] A claim term that does not contain the word "means" is presumptively not subject to § 112, ¶ 6 (now § 112(f)). *See CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1369 (Fed. Cir. 2002). The presumption "can be overcome if it is demonstrated that 'the claim term fails to recite sufficiently definite structure or else recites function without reciting sufficient structure for performing that function.'" *Lighting World, Inc. v. Birchwood Lighting, Inc.*, 382 F.3d 1354, 1358 (Fed. Cir. 2004) (quoting *CCS Fitness*, 288 F.3d at 1369); *Mass. Inst. of Tech. & Elecs. for Imaging, Inc. v. Abacus Software*, 462 F.3d 1344, 1354 (Fed. Cir. 2006) ("*MIT*") ("Claim language that further defines a generic term like 'mechanism' can sometimes add sufficient structure to avoid 112 ¶ 6.").

       This presumption, however, "is a strong one that is not readily overcome." *Lighting World*, 382 F.3d at 1358; *Flo Healthcare Solutions, LLC v. Kappos*, 697 F.3d 1367, 1374 (Fed. Cir. 2012) ("When the claim drafter has not signaled his intent to invoke § 112, ¶ 6 by using the term 'means,' we are unwilling to apply that provision without a showing that the limitation

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[1] The following analysis applies with equal force to the "ratio element" term in claim 24. Therefore, "a ratio element, said ratio element being capable of continuously calculating a ratio between two calculated average pressures P_d/P_a from said floating average of measured physiological variables (P_a, P_d)" is construed to mean "a computer program or computer software that can continuously divide said floating average of measured physiological variable (P_d) by said floating average of measured physiological variable (P_a)."

essentially is devoid of anything that can be construed as structure. Thus, we will not apply §

112, ¶ 6 if the limitation contains a term that 'is used in common parlance or by persons of skill

in the pertinent art to designate structure.'" (internal citations omitted)). Even though a term

might not bring a particular structure to mind, that is not dispositive and the court can look to the

dictionary to see if the term is one that is "understood to describe structure, as opposed to a term

that is simply a nonce word or a verbal construct that is not recognized as the name of structure

and is simply a substitute for the term 'means for.'"[2] *Lighting World*, 382 F.3d at 1360; *MIT*,

462 F.3d at 1354.

In *MIT*, for example, the Federal Circuit found that the term "colorant selection

mechanism" was subject to § 112, ¶ 6. *See MIT*, 462 F.3d at 1354 (noting that the patentee used

"mechanism" and "means" as synonyms and that "[a]t least one dictionary definition equates

mechanism with means"). Moreover, "colorant selection" was not defined in the specification,

did not have a dictionary definition, and there was no showing that "colorant selection

mechanism" would "connote sufficient structure" to one of ordinary skill in the art. *Id.* The

Federal Circuit later relied on *MIT* in holding that a claim reciting a "mechanism for moving said

finger" was subject to § 112, ¶ 6. *Welker Bearing Co. v. PHD, Inc.*, 550 F.3d 1090, 1095-97

(Fed. Cir. 2008). In addition to a dearth of structural context in the claim language, the

"mechanism for moving said finger" also lacked an adjective that "endows the claimed

'mechanism' with a physical or structural component." *Id.* at 1096. Recognizing that the person

having ordinary skill in the art ("PHOSITA") "would have no recourse but to turn to the []

patent's specification to derive a structural connotation for the generically claimed 'mechanism

for moving said finger,'" the Court applied § 112, ¶ 6. *Id.* (hinting that inclusion of "a 'finger

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[2] A "nonce word" is "a word coined and used for a single occasion."

displacement mechanism,' a 'lateral projection/retraction mechanism,' or even a 'clamping finger actuator,'" in the patent would have provided sufficient structural support to permit the court to delve into the PHOSITA's understanding of the term). In contrast, the Federal Circuit held that "detent mechanism" was not subject to § 112, ¶ 6 because "the noun 'detent' denotes a type of device with a generally understood meaning in the mechanical arts, even though the definitions are expressed in functional terms." *Greenberg v. Ethicon Endo-Surgery, Inc.*, 91 F.3d 1580, 1583 (Fed. Cir. 1996).

Although an examination of the language in claim 16 shows that the "ratio element" limitation itself is devoid of structure, § 112, ¶ 6 is inapplicable because the patentees acted as their own lexicographers. In its *MIT* decision, the Federal Circuit noted that whether the claim term was "defined in the specification" is a relevant consideration for determining the applicability of § 112, ¶ 6 to claim language that does not contain the word "means." *See MIT*, 462 F.3d at 1354. The specification here defines an "[e]lement being capable of calculating a ratio P_d/P_a from said measured physiological variables P_a, P_d by processing said signals" as "a computer program or computer software, stored in one of the storages connected to the control unit." '514 patent, 4:57-60. The specification further notes that the "control unit is implemented as a micro-computer or a CPU." *Id.* at 4:62. The patentees' definition also shows that "ratio element" is not merely a nonce word or a substitute for the phrase "means for." *See Lighting World*, 382 F.3d at 1358. Instead, the patentees specifically envisioned the "ratio element" as a computer program or computer software. This is sufficient to prevent Volcano from overcoming the "strong" presumption against § 112, ¶ 6's application to a claim term that does not contain the word "means."

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The parties also disagree on the function of the computer program/software, and that disagreement turns on the meaning of the word "from" in the claim language. The claim language requires calculating a "ratio P_d/P_a *from* said measured physiological variables (P_a, P_d) by processing said processable signals." '514 patent, claim 16 (emphasis added). In other words, the ratio is calculated by processing the variables P_a and P_d. The word "said" describing the physiological variables refers to the immediately preceding "sensor element" limitation, where the patentee claims a "sensor element being capable of detecting continuously at least two physiological variables, arterial pressure (P_a) and distal coronary pressure (P_d)." *Id.*

St. Jude's proposal attempts to broaden the scope of the claim beyond P_a and P_d. More specifically, St. Jude suggests that the ratio's components are the distal coronary pressure and the arterial pressure, which are measured from P_d and P_a, respectively. (D.I. 133, p. 1) (proposing as structure a computer program that can divide "a distal coronary pressure from the measured physiological variable P_d by an arterial pressure from the measured arterial variable P_a")). St. Jude's construction is inconsistent with the claim language which defines arterial pressure as P_a and distal coronary pressure as P_d. The Court adopts Volcano's alternative proposed definition because it stays true to the claim language and the specification by requiring the division of P_d by P_a through processing the processable signals.

2. "a marking element, said marking element being capable of marking automatically, or manually by an operator/user, at least one interesting point or portion on the graph"

a. *Volcano's proposed construction*: This is a means-plus-function term with the function of "marking automatically, or manually by an operator/user, at least one interesting point or portion on the graph"; the corresponding structure is "computer software," however, no

algorithm implemented by that software is disclosed by the specification. Therefore, this limitation is indefinite.

The limitation "interesting point or portion on the graph" is also indefinite.

b. *St. Jude's proposed construction*: "A computer program or computer software that can mark a point, area, or region on the graphical display of interest to the user, chosen either automatically or by the user." Alternatively, if § 112, ¶ 6 applies, the corresponding structure is "a computer program or computer software that can mark a point, area, or region on the graphical display of interest to the user, chosen either automatically or by the user available from the graphical interface system."

The term "interesting point or portion on the graph" is not indefinite and means "a point, area, or region on the graphical display of interest to the user, chosen either automatically or by the user."

c. *Court's construction*: "A computer program or computer software that can mark a point on the graphical display of interest to the user, chosen either automatically or by the user." The "interesting point or portion of the graph limitation" means "a point on the graph that can be used to calculate a new physiological variable."

The term "marking element" is not subject to § 112, ¶ 6, and the analysis of "marking element" parallels that of "ratio element," discussed in section III.A.1, *supra*. Again, the patentees here acted as their own lexicographers. The specification states that an "[e]lement being capable of marking automatically, or manually by an operator/user, at least one interesting point or portion on the graph . . . [is] also implemented as software used by the control unit." '514 patent, 5:55-61. A definition in the specification is a relevant consideration when determining whether to apply § 112, ¶ 6 to a claim term for which the word "means" is absent.

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See MIT, 462 F.3d at 1354. Therefore, the Court is persuaded that Volcano has not overcome the strong presumption against construing "marking element" as a means-plus-function term.

The parties also dispute whether marking an "interesting point or portion on the graph" is indefinite. Volcano cites *Datamize, LLC* for the proposition that an objective standard must exist that permits the public to discern the claimed invention's scope. *Datamize, LLC v. Plumtree Software, Inc.*, 417 F.3d 1342, 1350-56 (Fed. Cir. 2005) (finding "aesthetically pleasing" indefinite pursuant to § 112, ¶ 2 for failing to particularly point out and distinctly claim the "subject matter which the patentee regards as his invention"). St. Jude responds by pointing to a definition in the specification. The patentees defined the "interesting point" when calculating FFR as "the minimum value of the displayed pressure ratio-graph." *See* '514 patent, 5:61-62. The specification also discusses automatically and manually marking several other points. For example, the specification describes the system automatically marking the minimum value on the P_d/P_a graph once the graph is complete. *Id.* at 7:19-22. If an "artifact," or negative spike, caused that minimum, the marker "can be moved to a more proper point" where the new FFR value will be computed. *Id.* at 7:26-30. The user can also activate the marker function during recording to mark certain events, such as a cough or when the sensor is moved to a different location. *Id.* at 7:31-34. Finally, in the event that multiple stenoses are present, the user can "mark a plurality of measurement points" and use these points "for the calculation of several FFR-values." *Id.* at 7:35-38. Although these points are not specifically referred to as "interesting points" in the specification, the patentees' discussion of them in the context of calculating a new physiological variable makes clear that these points are important and therefore could be of interest to a user.

These examples show that Volcano has failed to meet its burden of proving that "interesting point" is indefinite. *See Datamize, LLC*, 417 F.3d at 1347 ("Only claims 'not

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amenable to construction' or 'insolubly ambiguous' are indefinite."); *Personalized User Model LLP v. Google Inc.*, 2012 WL 295048, at *23-24 (D. Del. Jan. 25, 2012) (finding patent that estimates whether documents are "of interest to the user" definite because the specification describes a method for quantifying whether a document was received positively or negatively by the user). Moreover, the Court's construction alleviates Volcano's concerns about subjectivity because any point on the graph can be used to calculate a new physiological variable. The '514 patent, therefore, does not "fail[] to provide any objective way to determine" whether a point would be considered "interesting." *See Datamize, LLC*, 417 F.3d at 1356.

3. "a calculating element, said calculating element being capable of using said interesting point on the graph for calculating a new physiological variable"

a. *Volcano's proposed construction*: This is a means-plus-function term with the function of "using said interesting point on the graph for calculating a new physiological variable"; the corresponding structure is "a computer program or computer software," however, no algorithm implemented by that program or software is disclosed by the specification. Therefore, this limitation is indefinite.

The limitations "interesting point on the graph" and "calculating a new physiological variable" are also indefinite.

b. *St. Jude's proposed construction*: Section 112, ¶ 6 does not apply and the term means "a computer program or computer software that can compute a value from the interesting point or portion." Alternatively, if § 112, ¶ 6 does apply, the structure is "a computer program or computer software that can compute a value from the interesting point or portion, such as calculating FFR using the calculating methods described in the patent."

"Interesting point or portion on the graph" is not indefinite and means "a point, area, or region on the graphical display of interest to the user, chosen either automatically or by the user." "Calculating a new physiological variable" is not indefinite and means "computing a value from the interesting point or portion."

c. *Court's construction*: The "calculating element" term means "a computer program or computer software that can compute a new physiological variable from the interesting point." The "interesting point or portion of the graph limitation" means "a point on the graph that can be used to calculate a new physiological variable." The term "calculating a new physiological variable" means "computing an FFR value from the interesting point."

The term "calculating element" is not subject to § 112, ¶ 6, and the analysis of "calculating element" parallels that of "ratio element," discussed in section III.A.1, *supra*. Again, the patentees here acted as their own lexicographers. The specification states that an "[e]lement being capable of using such an interesting point on the graph for calculating a new physiological variable [is] also implemented as software used by the control unit." '514 patent, 5:58-61. A definition in the specification is a relevant consideration when determining whether to apply § 112, ¶ 6 to a claim term for which the word "means" is absent. *See MIT*, 462 F.3d at 1354. Therefore, the Court is persuaded that Volcano has not overcome the presumption against construing "calculating element" as a means-plus-function term.[3]

As discussed in section III.A.2, *supra*, "interesting point" is construed to mean "a point on the graph that can be used to calculate a new physiological variable."

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[3] Although the Court agrees with the bulk of St. Jude's construction, its proposal that the computer program be able to compute "a value" is too broad. Both the claim language and the specification describe calculating a "new physiological variable," not any "value," and the term's definition is limited accordingly. *See* '514 patent, claim 16; 5:58-60.

The parties also dispute whether the term "calculating a new physiological variable" is indefinite. St. Jude argues that FFR is an example of a new physiological variable that is supported by the specification.[4] Volcano counters that there is no support for the calculation of any new physiological variable in the specification, and that FFR cannot be a *new* physiological variable, within the meaning of the claim language, because FFR is already calculated at each point by the "ratio element." (D.I. 133, p. 65).

The specification discloses the idea of calculating a new physiological variable in connection with its description of the flow chart in Figure 2. *See* '514 patent, 3:21-24 ("[M]arking automatically, or manually by an operator/user, at least one interesting point or portion on the graph; [and] using such an interesting point on the graph for calculating a new physiological variable."). The specification further states that if an artifact is detected the marker can be moved to a "more proper point, and the system will immediately display the FFR-value corresponding to the point selected." *Id.* at 7:28-30. The Court disagrees with Volcano's argument that the use of the word "display," instead of "calculate," in this passage means that the FFR value has already been calculated at every point on the graph prior to placing the marker on any particular point. *See id.* Additionally, the specification discloses the formula for calculating FFR. *Id.* at 1:28-36.

This constitutes sufficient evidence to find that FFR is one example of a new physiological variable within the context of the claim language. In the Court's opinion, constraining "calculating a new physiological variable" to what is disclosed in the specification,

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[4] St. Jude also points to the gradient (P_a-P_d) as a physiological variable "well-known in the art," but readily admits that its calculation "is not spelled out in the '514 patent." (D.I. 133, p. 61).

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namely FFR, is the proper construction here.[5] Therefore, "a new physiological variable" is not "insolubly ambiguous," and the Court declines to find the term indefinite.

    4. "software code for performing the steps of claim 1" and "a computer readable program for causing a processor in a control unit to control an execution of the steps of claim 1"

        a. *Volcano's proposed construction*: This is a means-plus-function term with the function of "performing the steps of claim 1"; the corresponding structure is "computer software," however, no algorithm implemented by that software is disclosed by the specification. Therefore, this limitation is indefinite.[6]

        b. *St. Jude's proposed construction*: "A computer program or subroutine."

        c. *Court's construction*: Plain and ordinary meaning.

    Volcano argues that it has overcome the presumption against applying § 112, ¶ 6 to "software code" and "computer readable program" because the only structure provided in the claim language is unspecified software. St. Jude, on the other hand, alleges that both terms mean "a computer program or subroutine." The Court is not persuaded that it should adopt either construction.

    In support of its position, Volcano principally relies upon the Federal Circuit's *Altiris* decision. There, the claim language described a "means of booting" that involved a first and second "set of commands," and the Court concluded that it was a means-plus-function limitation. *Altiris, Inc. v. Symantec Corp*, 318 F.3d 1363, 1375-76 (Fed. Cir. 2003). But the term "means for booting" at issue in *Altiris* has the word "means" in the claim language. As a result, and

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[5] St. Jude does not contest this narrowing construction. (D.I. 133, p. 61 ("[W]hether the Court limits 'calculating element' to FFR or adopts St. Jude's broader construction is irrelevant.")).

[6] Volcano's proposed construction for "a computer readable program for causing a processor in a control unit to control an execution of the steps of claim 1" is identical, with the exception that the proposed function is "causing a processor in a control unit to control an execution of the steps of claim 1."

unlike the disputed terms here, there was no presumption against applying § 112, ¶ 6. In the same decision the Federal Circuit affirmed the district court's construction of "automation code," which is more analogous to the computer program at issue here, outside of the § 112, ¶ 6 framework. *Id.* at 1374-75 (defining "automation code" as "the code in the automation partition which loads an operating system, LAN drivers for the resident NIC, and a program for reading a database on the network server to ascertain the automation commands to be executed").

St. Jude did not elaborate on why it included a "subroutine" in its proposed definition. If, as it appears from the context of St. Jude's argument, a subroutine is simply part of a computer program, its inclusion seems redundant. Therefore, both terms are to be construed according to their plain and ordinary meaning. *See Phillips,* 415 F.3d at 1312 ("[W]ords of a claim are generally given their ordinary and customary meaning." (internal quotations omitted)).

5. "displaying . . . intermediate and final results of the method of claim 1"

a. *Volcano's proposed construction:* "Display[ing] the values of the ratio P_d/P_a as they are calculated (*i.e.*, in real-time)."

b. *St. Jude's proposed construction:* "Displaying values of any of the following results: processable P_a values, processable P_d values, floating average, or a ratio P_d/P_a."

c. *Court's construction:* "Displaying values of any of the following results: processable P_a values, processable P_d values, floating average, or a ratio P_d/P_a."

The issue here is the definition of "intermediate and final results" in the context of the '514 patent. St. Jude argues that the intermediate results are "values such as the processable P_a and P_d values and the floating averages," and the final result is "a ratio P_d/P_a." (D.I. 133, p. 79). Volcano counters that the final result is "the specified graph of P_d/P_a formed and displayed, and therefore the 'intermediate result,' which is not described in the '514 patent, must be referring to

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a portion of the same 'result'—a graph formed and displayed as it is created." (*Id.*, p. 82).   The

Court agrees with St. Jude.

Claim 5 is dependent on claim 1, which requires "detecting continuously at least two

physiological variables, arterial pressure (P_a) and distal coronary pressure (P_d)," "transducing

said physiological variables to processable signals," delivering those signals to a processing unit,

processing the signals, and then continuously calculating a ratio. '514 patent, claim 1. It is true

that the P_d and P_a values are *inputs* in the sense that they are components of the final result: the

P_d/P_a ratio. But P_d and P_a are also the *result* of the intermediate steps of claim 1, including the

transducing step. Therefore, the "intermediate and final results" properly encompass these

values as intermediate results and the claim is not limited to displaying real-time results, as

posited by Volcano.

      6. "displaying said graph of the data resulting from said calculation"

          a. *Volcano's proposed construction*: Indefinite.

          b. *St. Jude's proposed construction*: "Displaying said graph" means "displaying

as a set of points, as a line or line segment, as a curve, or as an area"; "of the data resulting from

said calculation" means "of a ratio $(P_d-P_v)/(P_a-P_v)$."

          c. *Court's construction*: "Displaying said graph" means "displaying as a set of

points, as a line or line segment, as a curve, or as an area"; "of the data resulting from said

calculation" means "of a ratio $(P_d-P_v)/(P_a-P_v)$."

Volcano argues that the term "displaying said graph of the data resulting from said

calculation," found in dependent claim 2, is indefinite. Volcano notes that both claim 1 and

dependent claim 2 teach a method that involves a calculation, and that claim 2's reference to

graphing "said calculation" is insolubly ambiguous because a PHOSITA would not know

whether the calculation in claim 1 or claim 2 must be graphed. *See Exxon Research & Eng'g Co. v. United States*, 265 F.3d 1371, 1375 (Fed. Cir. 2001). It would be legal error, according to Volcano, to impute an order into the steps of a method claim unless an order is actually recited. *See Interactive Gift Express, Inc. v. Compuserve Inc.*, 256 F.3d 1323, 1342 (Fed. Cir. 2001). Therefore, Volcano insists that there is no basis for construing the second "graphing" limitation as referring to the second calculation. St. Jude counters that both claim 1 and claim 2 have a calculation limitation and a graphing limitation, thereby making it obvious to the PHOSITA which calculation is graphed in which claim. The Court agrees with St. Jude.

A brief description of the claim structure is instructive. Claim 1 is a method claim and one of its limitations describes calculating a ratio of P_d/P_a. The following limitation requires "forming a graph and displaying said graph of the data resulting from said calculation." Claim 1's requirement to graph "said calculation" clearly refers to the calculated ratio of P_d/P_a. Claim 2 is dependent on claim 1 and is laid out in a similar structure. The fourth limitation of claim 2 discloses the calculation of a new ratio: $(P_d-P_v)/(P_a-P_v)$. The fifth and final limitation of claim 2 requires "forming a graph and displaying said graph of the data resulting from said calculation."

In this context, it is clear that "said calculation" in claim 2 refers to the ratio calculation disclosed in the immediately preceding limitation of claim 2, namely $(P_d-P_v)/(P_a-P_v)$, and not the ratio disclosed in claim 1. This construction is consistent with the rules of English grammar and common sense. *See Finisar Corp. v. DirecTV Grp., Inc.*, 523 F.3d 1323, 1336 (Fed. Cir. 2008) (recognizing instances where courts applied "the rules of English grammar to statutory construction"). Were that not the case, the calculation in claim 1 would be graphed twice—in both claim 1 and dependent claim 2—and the calculation described in claim 2 would not be

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graphed at all. This cannot be the case, and the more logical reading of the claims is the one

advanced by St. Jude.[7]

IV. CONCLUSION

Within five days the parties shall submit a proposed Order consistent with this

Memorandum Opinion suitable for submission to the jury.

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[7] During the *Markman* hearing the Court invited Volcano to submit a letter citing a Federal Circuit case holding that a claim term with two possible antecedents is indefinite. Volcano provided a letter citing *Baldwin Graphic Systems v. Siebert, Inc.*, 512 F.3d 1338 (Fed. Cir. 2008). (D.I. 161). Volcano admits that *Baldwin* is "not controlling with regard to the specific facts presented here." (*Id.*). In fact, *Baldwin* addresses whether the use of definite articles to refer back to a claim term prefaced with the indefinite article "a" or "an" can alter the default rule that "a" or "an" means "one or more." *See Baldwin Graphic Systems*, 512 F.3d at 1342-43. The question currently before the Court, however, is whether the presence of two possible antecedents renders a claim indefinite. Although the *Baldwin* court cites the section of the Manual of Patent Examining Procedure that Volcano relies on to support its position, the facts are distinguishable and the court's analysis does not illuminate the current inquiry.